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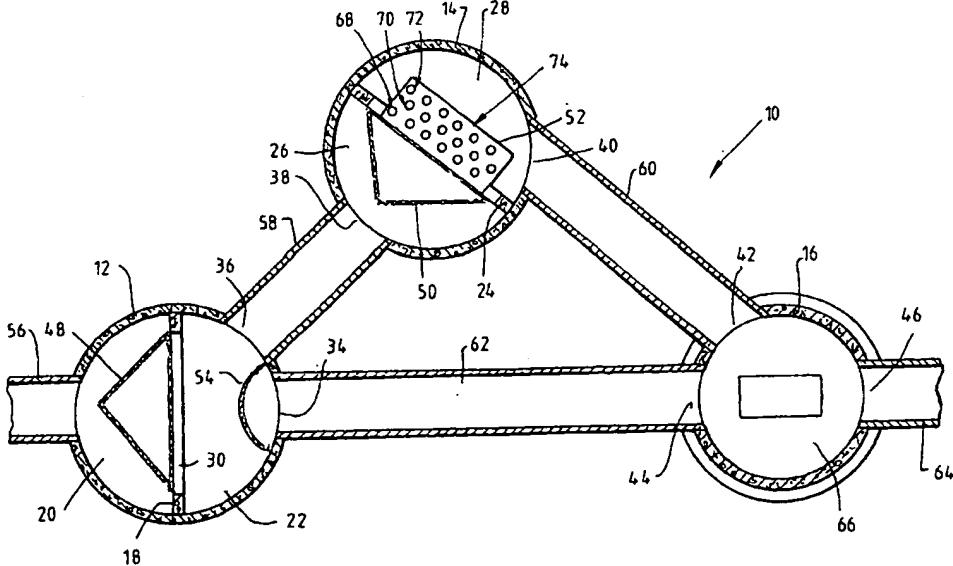
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(54) Title: LIQUID PURIFYING APPARATUS



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(57) Abstract: A liquid purifying apparatus includes one or more tanks including a filtration tank including a V-shaped screen, a treatment for dispensing a treatment agent upon immersion in liquid, a floating material collection tank, and a heavy material collection tank. One or more of the tanks are connected to purify liquid passing therethrough.

## LIQUID PURIFYING APPARATUS

### Field of the Invention

The present invention relates to an invention for purifying liquids such as waste water.

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### Summary of the Invention

According to the present invention there is provided a screen for use in a filtration tank including:

- 10 a mounting panel for mounting the screen inside the tank, the mounting panel extending generally vertically inside the tank, the mounting panel having a liquid egress portal; and
  - a screen member coupled to the mounting panel including:
    - an upper portion being V-shaped in cross-section, the upper portion having an apex edge, the upper portion being mounted to the mounting panel by edges coinciding
    - 15 with the tips of the V-shape in cross-section opposite the apex; and
      - a lower portion intersecting with the upper portion, the lower portion tapering from the apex edge towards the mounting panel.

- 20 According to the present invention there is provided a screen member for use in a filtration tank including:

- a first screen portion; and
  - a second screen portion disposed at an acute angle to the first screen portion so that the screen portions are substantially V-shaped in cross section, at least one of the screen portions including a mesh screen;
- 25 wherein an apex of the V-shape forms a nose of the screen member, the nose including an apex edge for dividing flow of liquid over the screen portions, whereby the flow over the screen portions assists in keeping the mesh screen substantially free of blockage.
- 30 Preferably the screen member includes a lower portion extending from a lower edge of the first screen portion and the second screen portion, the lower portion tapering in shape away from the apex.

According to the present invention there is provided filtration tank including:

a mounting panel extending generally vertically inside a liquid holding tank, the mounting panel dividing the tank into a first chamber and second chamber, the panel  
5 having a liquid egress portal providing communication between the first chamber and the second chamber; and

a screen member coupled to the mounting panel, the screen member including:  
a portion being V-shaped in cross-section, the portion having an apex edge, the upper portion being mounted to the mounting panel by edges coinciding with the tips of  
10 the V-shaped in cross-section opposite the apex.

Also according to the present invention there is provided a treatment tank including:

a chamber inside the tank;  
a support means mounted inside the chamber; and  
15 a treatment agent dispensing means mounted to the support means;  
wherein the treatment agent dispensing means includes a first agent dispenser and a second agent dispenser, the dispensers being arranged to dispense the treatment agent upon immersion in liquid, the first agent dispenser arranged to be mounted lower in the chamber than the second agent dispenser,  
20 whereby, as the liquid level in the tank increases in height, the second dispenser means becomes immersed in the liquid to increase the dispensing of the agent to liquid in the tank.

25 Preferably the treatment agent dispensing means includes a third agent dispenser arranged to be higher in the chamber than the second agent dispenser.

Preferably the treatment tank includes a filtering screen provided to filter liquid prior to entry of the treatment agent dispensing means.

30 According to the present invention there is provided an apparatus for purifying liquid including:  
a first tank having a first chamber and a second chamber; and

a second tank having a third chamber and a fourth chamber,  
wherein the first chamber is connected to the second chamber by a first portal,  
the first portal being lower in the tank than an inlet to a first chamber,  
wherein the third chamber is connected to the fourth chamber by a second portal,  
5 a screen intervening between a liquid flow path through the second portal into the fourth chamber,  
wherein the second chamber of the first tank is connected to the third chamber of the second tank, wherein the fourth chamber is provided with an outlet,  
whereby, in use, fluid or particles that have a lower specific gravity will float and  
10 10 be collected in the first chamber and screened particles will be collected in the third chamber.

Preferably a second screen is provided to filter particles from entering the second chamber from the first chamber. Preferably the fourth chamber is provided with a  
15 treatment means.

Preferably the second chamber is provided with an overflow outlet.

Preferably the apparatus includes a third tank that receives liquid from the outlet of the  
20 second tank and liquid from the overflow outlet of the second chamber.

Preferably the first screen is V-shaped in cross-section. Preferably the first screen is tapered at the bottom. Preferably the first screen has a mesh size that prevents particles greater than 1.6 mm in diameter from passing therethrough.  
25

Preferably the second screen is V-shaped in cross-section. Preferably the second screen is tapered at the bottom. Preferably the second screen has a mesh size that prevents particles greater than 0.9 mm in diameter from passing therethrough.

30 Preferably the first tank is divided into the first and second chambers by a baffle wall. Preferably the first portal is provided in the baffle wall. Preferably the baffle wall is provided with an overflow weir.

Preferably the second tank is divided into the third and fourth chambers by a second baffle wall. Preferably the second portal is provided in the second baffle wall. Preferably the second baffle wall is provided with an overflow weir.

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Preferably the treatment means includes a plurality of containers arranged to provide purifying/disinfecting agent to liquid in fourth chamber. Preferably the depth of the containers is staggered, so that an increasing number of containers make contact with liquid in the fourth chamber as the liquid level rises and would thereby introduce a greater dose of the agent to liquid in the fourth chamber.

10 Also, according to the present invention there is provided an apparatus for purifying liquids, the apparatus including:

- 15 a first vessel having a first chamber with a first inlet; and
- a second vessel having a second chamber with an outlet,
  - wherein the first chamber is connected to the second chamber by a connecting portal, the connecting portal being lower within the second vessel than the outlet,
    - wherein a screen is provided in the first chamber for screening liquid entering the portal,
  - 20 whereby, in use, particles of a size larger than permitted to pass through the screen are collected in the first chamber and particles or fluid with a lower specific gravity than the purified waste water tend to float and not pass through the portal into the second chamber.
- 25 The first and second vessels may be formed by dividing a tank. Alternatively the first and second vessels may be formed in separate tanks.

30 Preferably the first chamber has an access hole for periodic removal of material that does not pass through the screen. Preferably the apparatus includes a third vessel having a third chamber, the third vessel intervening between the screen and the portal for collection of floating material. Preferably the third chamber has an access hole for periodic removal of material that is collected in the third chamber.

Preferably a screen is provided in a first tank, the screen dividing the first tank into the first vessel and a fourth vessel having a fourth chamber.

- 5 Preferably the portal is provided in a dividing wall of a second tank, the dividing wall dividing the second tank into the third vessel and the second vessel, the fourth chamber connected to the third chamber by a connecting pipe. Preferably the connecting pipe opens into the third chamber higher than the portal.
- 10 Preferably the apparatus includes a fifth vessel for collecting heavy materials, the fifth vessel having an egress port higher in the tank than an ingress port. Preferably the egress port is an opening of an egress pipe that extends downwardly into the fifth vessel before exiting the fifth vessel. Preferably the pipe is located in the centre of the fifth vessel. Preferably the fifth vessel and the first vessel are arranged to be in a circuit for
- 15 fluid circulating between the first vessel and the fifth vessel.

Preferably the screen is V shaped in cross section, a nose of the V pointing towards incoming flow of liquid from the inlet. Preferably the screen directs fluid into a pipe leading to the fifth vessel and opening into the fifth vessel to form the ingress port.

- 20 Preferably the egress pipe from the fifth vessel leads to the first vessel and opens into the first vessel to form a second inlet to the first vessel, the second inlet arranged to direct fluid flow at the nose of the screen.

- 25 Preferably the apparatus further includes a treatment tank arranged to disperse a treatment agent therein, the treatment tank receiving liquid from the outlet of the second chamber.

According to another aspect of the present invention there is provided an apparatus for purifying liquid including:

- 30 a first vessel having a first chamber and a second chamber; and  
a second vessel having a third chamber and a fourth chamber,  
wherein the first chamber is connected to the second chamber by a dividing

member, the dividing member having a screen for allowing screened waste water to be passed into the second chamber, the screen being V shaped in cross section, a nose of the V pointing towards an incoming flow of liquid;

wherein the third chamber is connected to the fourth chamber by a first portal, 5 the first portal being lower in the vessel than an outlet inlet to the fourth chamber; whereby, in use, particles of a size larger than permitted to pass through the screen are collected in the first chamber and particles or fluid with a lower specific gravity than the purified liquid will float and be collected in the third chamber.

10 According to yet another aspect of the present invention there is provided a waste collection tank comprising:

- 15 a tank member having a top and a bottom;
- an inlet to the tank member between the top and the bottom;
- an outlet pipe having an opening into the inside of the tank member between the inlet and the top, the pipe extending downwardly towards the bottom and then out of the tank member.

According to a further aspect of the present invention there is provided an apparatus for purifying liquid such as waste water including:

20 a first vessel having a first chamber and a second chamber, the first chamber being connected to the second chamber by a dividing member, dividing member having a screen for allowing screened liquid to be passed into the second chamber, the screen being V shaped in cross section and the nose of the V pointing towards incoming flow of liquid; and

25 a waste collection tank having a top and a bottom, wherein the first chamber of the first vessel is connected to the waste collection tank by a pipe leading from the first chamber to an inlet of the collection tank between the top and the bottom;

30 wherein the an outlet pipe of the collection tank has an opening into the inside of the tank member between the inlet and the top, the pipe extending downwardly towards the bottom and then out of the collection tank,

whereby, in use, particles of a size larger than permitted to pass through the

screen are collected in the first chamber and heavy particles or fluid having a greater specific gravity than the liquid will collect in the collection tank.

According to the another aspect of the invention there is a liquid purifying apparatus 5 including one or more of the following tanks:

a filtration tank including a screen member dividing the tank into a first chamber and second chamber, a portion of the screen member being V-shaped in cross-section, the portion having an apex edge, an apex of the V-shape pointing toward an incoming liquid stream, whereby particles of size larger than allowed to pass through the screen 10 are collected in the filtration tank and the incoming liquid stream reduced blockages of the screen member;

a treatment tank including a treatment agent dispensing means mounted to the support means, wherein the treatment agent dispensing means includes is arranged to dispense the treatment agent upon immersion in liquid,

15 a floating material collection tank including a third chamber and a fourth chamber, wherein the third chamber is connected to the fourth chamber by a first portal, the first portal being lower in the tank than an inlet to the third chamber, whereby, in use, fluid or particles that have a lower specific gravity will float and be collected in the third chamber;

20 a waste collection tank including a top, a bottom, an inlet to the waste collection tank between the top and the bottom and an outlet pipe having an opening into the inside of the waste collection tank between the inlet and the top, the outlet pipe extending downwardly towards the bottom and then out of the waste collection tank, whereby heavy liquids or particles are collected in the waste collection tank;

25 wherein the one or more of the tanks are connected to purify liquid passing therethrough.

#### Detailed Description of Preferred Embodiments

In order to provide a better understanding, a preferred embodiment will now be 30 described in greater detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of a purifying apparatus in accordance with the present invention;

Figure 2 is a schematic cross-sectional side view of the apparatus of Figure 1;

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Figure 3 is an upper perspective view of a screen in accordance with the present invention;

10 Figure 3A is an upper perspective view of an alternative screen in accordance with the present invention;

Figure 4 is an upper perspective view of a treatment dispensing means in accordance with the present invention;

15 Figure 5 is a schematic plan view of another embodiment of a purifying apparatus in accordance with the present invention;

Figure 6 is a schematic side elevation of the apparatus of Figure 5; and

20 Figure 7 is a schematic side elevation of a waste collection tank in accordance with the present invention.

Referring to Figures 1 and 2, there is shown a liquid purifying apparatus 10. The apparatus is highly suited to treatment of waste water, such as storm water run off. It is 25 understood that it is suitable for purifying other liquids. The apparatus 10 includes a first tank 12, a second tank 14 and a third tank 16. The first tank 12 is divided by a barrier wall 18 into a first chamber 20 and a second chamber 22. The second tank 14 is divided by a barrier wall 24 into a third chamber 26 and a fourth chamber 28. The tanks 12, 14 and 16 are preferably cast of concrete.

30

The tanks 12, 14 and 16 are preferably cylindrical in shape with a flat base. The tank 12 has an inlet 32 about two thirds of the way up the side wall so that the tank can collect

liquid, such as waste water flowing into the tank from an inlet pipe 56 connected to the inlet 32. Situated within the first chamber 20 is a screen 48 mounted to the barrier wall 18. The screen 48 covers a portal 30 in the barrier wall 18 that provides access from the first chamber 20 to the second chamber 22 of the tank 12. The screen 48 covers the 5 portal 30 so that fluid must pass through the screen to enter the second chamber 22.

Referring to Figure 3, the screen includes an upper portion 100 and a lower portion 102. The upper portion includes two panels 104 and 106 that intersect at an angle to one another to form a V-shape in cross-section when looking down upon the screen 48. The 10 angle of the panels 104 and 106 to one another can vary to suit the particular application. The apex of the V-shape forms an apex edge 108. Edges 110 and 112 of each panel 104 and 106, respectively, coincide with tips of the V-shape. These edges 110 and 112 are mounted to the barrier wall 18.

15 The lower portion 102 tapers inwardly away from the apex edge 108 and towards the barrier wall 18. The lower portion 102 includes an additional bottom wall member 104 of triangular shape. The screen 48 as a whole is generally of a similar shape to the bow of a boat. The flow of fluid coming into the tank over the mesh of the screen allows it to be self cleaning.

20 Figure 3A shows the variation 48' on the screen of Figure 3. In this case the lower portion 102 does not taper towards the barrier wall 18. The bottom of the screen 116 will extend all the way to the base of the tank 12 or will be closed by a triangular panel (not shown). Each panel 104 and 106 is formed by a solid sheet of material and a 25 meshed window 118. The mesh allows liquid and particles of a small size to pass through the mesh forming the window 118. The screen 48' has a top panel 120 which forms the bottom of a channel 122 between upwardly extending sheets 124. The upwardly extending sheets 124 extending between respective panels 104 and 106 and a rear wall 126. The rear wall 126 forming part of or abutting barrier wall 18. The 30 channel 122 allowing the overflow of fluid if the fluid level rises above the top member 120.

Referring back to Figures 1 and 2, a lower portion of the screen 48 tapers so that particles prevented from passing through the screen are inclined to fall away from the screen and collect at the bottom of the first chamber 20. The portal 30 is positioned lower within the tank 12 than the inlet 32. As a result, fluids or particles that have a 5 lower specific gravity than the waste water will tend to float and thus be trapped within the first chamber 20 as waste water from the lower portion of the chamber 20 will pass to the second chamber 22 retaining the floating fluid and particles in the chamber 20.

The barrier wall 18 extends the majority of the height of the wall of the tank 12, 10 although at the top of the barrier wall 18 an overflow weir is provided so that should a blockage occur waste water can pass into the second chamber 22. In the case where screen 48' is used, the channel 122 forms part of the overflow weir. Furthermore the screen 48 is provided with an appropriate mesh size depending on the application of the apparatus 10. Preferably the mesh size is approximately 1.6 mm so that particles of 15 greater size than the mesh size are retained within the first chamber 20.

The second chamber 22 has a first outlet 34 and a second outlet 36. The first outlet 34 is covered by a barrier 54 having an arc shaped side wall and a flat bottom wall. The barrier 54 does not extend all the way to the top of the side wall of the tank 12 so that in 20 a blockage situation waste water can overflow the barrier 54 into the outlet 34 and thus exit via an overflow pipe 62.

The outlet 36 connects with a pipe 58 that connects the second chamber 22 (of the first tank 12) to the third chamber 26 (of the second tank 14) via inlet 38. The barrier wall 24 25 has a portal therethrough approximately the same level as the inlet 38. The barrier wall 24 also has an overflow weir at its top.

Covering the portal of the barrier wall 24 and extending into the third chamber 26 is a 30 second screen 50 of similar shape to the screen 48. The second screen may be similar to alternative screen 48'. The second screen 50 has an upper portion that is V-shaped from the top and tapers inward at its lower portion. The screen 50 has a smaller mesh size than the first screen 48. Preferably the mesh size is approximately 0.9 mm and thus

prevents particles of greater size from passing therethrough. Particles that fail to pass through tend to be collected at the bottom of the chamber 26. Extending from the portal of the barrier wall 24 into the fourth chamber 28 is a treatment means 52. The treatment means 52 provides a treatment such as a disinfection or purifying agent, such as 5 chlorine, to waste water passing through the portal of the barrier wall 24 into the fourth chamber 28. Alternative treatment agents include agents that breakdown or neutralise fertilizers, phosphates and nitrates. Waste water can then exit the fourth chamber 28 via outlet 40 and travel through joining pipe 60 to an inlet 42 of the third tank 16.

10 Referring to Figure 4, treatment means 52 is preferably in the form of a tray 74 containing a series of rows of containers, in this case cylinders 68, 70 and 72. The rows of cylinders 68, 70 and 72 provide the treatment/purifying agent to the waste water. Rows 70 and 72 are progressively higher than the first row 68 and thus only begin introducing the agent to the waste water as the height of the waste water increases.

15 Another way of achieving this is to have the cylinders in each row shorter in length than the previous row, thus the bottom of the cylinder increases in height relative to the previous row. The cylinders 68, 70 and 72 are provided with slits or holes so that water can gain access to the agent inside the cylinder and thus be treated by the agent.

20 Waste water exists chamber 28 by outlet 40, travels down pipe 60 and enters the tank 16 via the inlet 42. Alternatively if there has been a blockage and waste water has overflowed barrier 54 and passed through pipe 62 it will enter by inlet 44. Waste water can then fill the tank 66 and then pass out outlet 46 into outlet pipe 64.

25 The tank 12 is provided with inspection/maintenance shafts 76 and 80, each of which are covered by covers 78 and 82. This allows access to the chambers 20 and 22 for maintenance or pumping of collected material from the tank 12. The tank 14 is also provided with an access shaft 84 and cover 86 again to allow access to the interior of the tank for pumping/maintenance. Tank 16 is also provide with an access shaft 88 and 30 cover 90 also for allowing access to the interior 66 of the tank 16.

Referring to Figures 5 and 6, there is shown an alternative embodiment of a liquid

purifying apparatus 200. The apparatus 200 includes a first tank 212 and a second tank 214. The first tank 212 is divided by a barrier wall 218 having a V-shape in plan view. The first tank is divided into a first vessel having a first chamber 220 and another vessel having a chamber 222. The second tank 214 is divided by a barrier wall 224 into a 5 second vessel having a chamber 228 and a third vessel having a chamber 226. For convenience the vessel defining chamber 222 will be referred to as the fourth vessel defining a fourth chamber 222.

Tanks 212 and 214 are cast of concrete. Dividing wall 224 is also preferably cast of 10 concrete. Tanks 212 and 214 also preferably cylindrical in shape with a flat base 219 each having a cover 213. The cover 213 of the first tank 214 includes access openings 215 which are normally closed in operation, but allow access to the interior of the tank 214. Likewise the cover 213 of the second tank 214 also has openings 217 which are again normally covered in use, but allow access to the interior of the second tank 214.

15 The first tank 212 has an inlet 232 about two thirds of the way up it's side wall which has a pipe 256 coupled thereto for connection to an existing drainpipe. Liquid, such as waste water, is able to pass from the drain pipe through the opening 232 into the first chamber 220.

20 About two thirds of the top portion of each side of the dividing wall 218 is in the form of a screen 248 that allows fluid to pass through, but traps particles of a size greater than the gauge forming the screen. Preferably the mesh is gauged at 900 microns. Therefore particles greater than this size will be trapped within the first chamber 220. The screen 25 is generally in the form of a V-shape, however a nose of the V is preferred to be formed of a solid galvanized plate 251. Fluid that passes through the screen enters the fourth chamber 222. Fluid in the chamber 222 is able to exit the first tank 212 via an outlet 236 to travel through a connecting pipe 258 to an inlet 238 into the third chamber 226 of the second tank 214.

30 The dividing wall 224 is provided with a portal 230, which allows fluid to pass underneath the wall 224. The portal 230 is beneath (lower in the tank than) the inlet 238

and an outlet 246 of the second tank 214. Preferably the portal 230 is formed by leaving a gap between the separating barrier wall 224 and the base 219 of the tank 214 when the wall 224 is cast. The outlet 246 is connected to a connecting pipe 264 for joining to an existing drain line.

5

Extending from either side of the tank 212 in relation to the inlet 232 are pipes 302 and 303. Pipes 302 and 303 are positioned to receive fluid directed along the surface of the screens 248 that does not pass through the mesh. Each of the pipes 302 and 303 lead to a waste collection tank 300 and 301. The waste collection tanks 300 and 301 are mirror 10 images of one another and therefore for convenience only tank 300 will be described.

Referring to Figure 7, there is shown waste collection tank 300, which has a tank wall 310, a top lid 313 and a base 319. Within the base is a waste collection sump 312. The pipe 302 enters the tank wall 310 at an opening 318. The opening 318 is roughly half 15 way between the top 313 and the base 319. Extending down a majority of the centre axis of the tank is an outlet pipe 314 that bends at or near the base 319 and continues as pipe 304. An opening 316 of the pipe 314 is located between the inlet 318 and the top 313. The opening 316 is roughly two thirds of the height of the tank wall 310. Preferably the pipe 314 includes a plurality of slits 315 for allowing liquid to enter the 20 pipe 314, but keep solids beyond the width of the slits 315 within the collection tank. The lid 313 has an opening 308 that allows access to the interior of the tank 300. A biological or chemical control agent can be inserted in the tank 300 to disinfect/neutralise any contaminants therein.

25 Referring back to Figures 5 and 6, it can be seen that the pipe 314 is inclined from the base 319 of the tank 300 to return liquid that enters the outlet 316 into an inlet 306 of the first tank 212. It can therefore be seen that liquid can circulate between first tank 218 and each of the collection tanks 300 and 301.

30 The method of use and operation of the present invention will now be described with reference to the accompanying drawings.

The apparatus 10 of the present invention may be installed in an existing waste water pipeline system with an existing pipe making up pipe 56, 62 and 64 with the appropriate cuts in the existing pipe being provided to insert tank 12. Tank 16 may be an exiting tank. Pipes 56 and 60 and tank 14 are also inserted into the ground to the side of the 5 main path of the existing pipe.

Waste water coming from inlet pipe 56 enters the first chamber 20 of the first tank 12 and begins to fill the first chamber 20. Waste water passes through the screen 48 leaving behind particles larger than the mesh size of the screen 48. As the water level in 10 the first chamber 20 rises floating material will be retained in the chamber as it ordinarily will be prevented from passing to the second chamber 22 when the water level is above the portal 30. In the event of blockage, and the water level rising above the height of the barrier wall 18, waste water can overflow the weir portion into the second chamber 22.

15 Waste water accumulates in the second chamber 22 until it reaches a level of the outlet 36 whereupon it flows through pipe 58 into the inlet 38 of the third chamber 26 of the second tank 14. In the event of a blockage and the water level rising above the height of the barrier 54, water will spill over the barrier and exit the second chamber via the outlet 20 34 through the outlet pipe 62.

Waste water entering the third chamber 26 will collect in the second chamber until the water level reaches the portal of the second barrier 24 whereupon particles of size greater than the second screen 50 will be retained in the tank in the third chamber 26 25 and generally settle towards the bottom. Waste water will then pass through the screen 50 and portal in the second barrier 24 to the treatment means 52. The water will be dosed with chlorine or some other agent from the series of cylinders 68, 70 and 72. As the water level rises it will make contact with higher positioned rows of cylinders 70 and eventually 72. Waste water accumulates in the fourth chamber 28 until the level is 30 sufficient for it to exit the outlet 40 and passes through pipe 60 to inlet 42 of the third tank 16.

Waste water entering the inside 66 of the tank 16 will have been through two screens and have been purified/disinfected unless there was an overflow from the barrier 54 whereupon it will enter the interior of the tank 66 via inlet 44 from the pipe 62. When the waste water level in the interior of the tank 66 reaches the outlet level 46 it will then 5 exit by outlet pipe 64.

During normal operation tanks 12, 14 and 16 will be generally fill to the level of the respective outlets of the tanks so that, in particular, the flotation separation will occur in chamber 20. Furthermore should there be a blockage or restriction in flow, the 10 apparatus can accommodate such an event by overflowing walls 18, 24 and barrier 54. Once waste water flow subsides or is reduced and it is desired to maintain or clean out the tanks, access can be gained to pump or otherwise remove the contents of collected material in each of the tanks.

15 The apparatus 200 of the present invention may also be installed in an existing waste water pipeline system. Waste water coming from the inlet pipe 256 into the inlet 230 will begin to fill the first chamber 220. As the height of the water increases it will eventually encounter the screen portions 248. Screened waste water will pass through the screen leaving behind particles larger than the mesh size of the screens 248. As the 20 water level continues to increase it will eventually reach and begin flowing into pipes 302 and 303 leading to the collection tanks 300 and 301. It is preferred that pipe 303 is directly in line with the inlet 324 so that fast flowing liquid that fails to pass through the screens 248 will preferably enter the pipes 302 and 303. Fluid that travels through these pipes will enter collection tank 300 or 301. These tanks will quickly fill as the outlet 25 316 is above the inlet 318. Liquid entering will also be encouraged to circulate within the tank wall 310. This will provide a dwell time which will tend to allow heavier particles to sink towards and then collect in the collection sump 312. Furthermore, heavier particles will tend to congregate around the wall 310. The inner most liquid will be less turbulent and will overflow into the inlet 316 and travel through the pipe 314 30 into pipe 304 and be returned to the first tank 212 by inlet 306.

Fluid that passes through the screen 248 enters the fourth chamber 222 which will fill

when the level reaches outlet 236 it will flow through pipe 258 into inlet 238 of the second tank 214. Fluid then flows under the barrier 224 through the portal 230 while the level increases. Particles or liquid that are generally lighter than the rest of the waste water will float within the fourth chamber 222, pipe 258 and third chamber 226 5 remaining trapped there. Denser liquid (such as water compared to oil) can escape via the portal 230 into the second chamber 228.

Once the apparatus reaches equilibrium, liquid flowing therethrough will generally be at the water line indicated in Figure 6. It can therefore be seen that heavy particles will be 10 collected in collection tanks 300 and 301, particles that are too large in size to pass through the screens 248 will be collected in the first chamber 220, smaller but lighter floating particles will be collected in a third chamber 226 and the fourth chamber 222 with only waste water than has been screened and had floating debris removed allowed to exit into the apparatus 200 via pipe connector 264. It is noted that the treatment tank 15 14 of the earlier embodiment may also be provided at this outlet along with subsequent tank 16.

After flow has ebbed, or at a suitable time, captured residue in each of the chambers may then be removed via the access ports 215, 217, 308 and 309.

20 Modifications and variations may be made to the present invention without departing from the basic inventive concept. Such modifications may include additional stages in the apparatus. Each tank is modular, therefore different combinations of tanks (including from each embodiment of the purifying apparatus 10 and 200) can be used.

25 The mesh sizes of the screen may be changed to suit the particular type of waste water being accommodated. The number of rows of treatment agent dispensers may increase as necessary. The present invention has particular application in handling storm water although it is envisaged that other applications may be applicable.

30 Such modifications and variations are intended to fall within the scope of the present invention the nature of which is to be determined from the foregoing description.

**CLAIMS:**

1. A screen member for use in a filtration tank including:
  - 5 a first screen portion; and a second screen portion disposed at an acute angle to the first screen portion so that the screen portions are substantially V-shaped in cross section, at least one of the screen portions including a mesh screen; wherein an apex of the V-shape forms a nose of the screen member, the nose including an apex edge for dividing flow of liquid over the screen portions, whereby the flow over the screen portions assists in keeping the mesh screen substantially free of blockage.
  - 10
  - 15 2. A screen for use in a filtration tank including:
    - a mounting panel for mounting the screen inside the tank, the mounting panel extending generally vertically inside the tank, the mounting panel having a liquid egress portal; and a screen member coupled to the mounting panel including:
      - 20 an upper portion being V-shaped in cross-section, the upper portion having an apex edge, the upper portion being mounted to the mounting panel by edges coinciding with the tips of the V-shape in cross-section opposite the apex; and a lower portion intersecting with the upper portion, the lower portion tapering from the apex edge towards the mounting panel.
      - 25
      3. A filtration tank including:
        - a mounting panel extending generally vertically inside a liquid holding tank, the mounting panel dividing the tank into a first chamber and second chamber, the panel having a liquid egress portal providing communication between the first chamber and the second chamber; and
        - 30 a screen member coupled to the mounting panel, the screen member including:
          - a portion being V-shaped in cross-section, the portion having an apex edge, the upper portion being mounted to the mounting panel by edges coinciding with the tips of

the V-shaped in cross-section opposite the apex.

4. A treatment tank including:
  - a chamber inside the tank;
  - 5 a support means mounted inside the chamber; and
  - a treatment agent dispensing means mounted to the support means; wherein the treatment agent dispensing means includes a first agent dispenser and a second agent dispenser, the dispensers being arranged to dispense the treatment agent upon immersion in liquid, the first agent dispenser arranged to be mounted lower
  - 10 in the chamber than the second agent dispenser,  
whereby, as the liquid level in the tank increases in height, the second dispenser means becomes immersed in the liquid to increase the dispensing of the agent to liquid in the tank.
- 15 5. A treatment tank according to claim 4, wherein the treatment agent dispensing means includes a third agent dispenser arranged to be higher in the chamber than the second agent dispenser.
- 20 6. A treatment tank according to either claim 4 or 5, wherein the treatment tank includes a filtering screen provided to filter liquid prior to entry of the treatment agent dispensing means.
- 25 7. An apparatus for purifying liquid including:
  - a first tank having a first chamber and a second chamber; and
  - 25 a second tank having a third chamber and a fourth chamber,  
wherein the first chamber is connected to the second chamber by a first portal, the first portal being lower in the tank than an inlet to a first chamber,  
wherein the third chamber is connected to the fourth chamber by a second portal, a screen intervening between a liquid flow path through the second portal into the fourth
  - 30 chamber,  
wherein the second chamber of the first tank is connected to the third chamber of the second tank, wherein the fourth chamber is provided with an outlet,

whereby, in use, fluid or particles that have a lower specific gravity will float and be collected in the first chamber and screened particles will be collected in the third chamber.

5 8. An apparatus according to claim 7, wherein a second screen is provided to filter particles from entering the second chamber from the first chamber.

9. An apparatus according to either claim 7 or 8, wherein the fourth chamber is provided with a treatment means.

10

10. An apparatus according to any one of claims 7 to 9, wherein the second chamber is provided with an overflow outlet.

15

11. An apparatus according to any one of claims 7 to 10, wherein the apparatus includes a third tank that receives liquid from the outlet of the second tank and liquid from the overflow outlet of the second chamber.

12. An apparatus according to any one of claims 7 to 11, wherein the first screen is V-shaped in cross-section.

20

13. An apparatus according to any one of claims 7 to 12, wherein the first screen is tapered at the bottom.

25

14. An apparatus according to any one of claims 7 to 13, wherein the first screen has a mesh size that prevents particles greater than 1.6 mm in diameter from passing therethrough.

15. An apparatus according to claim 8, wherein the second screen is V-shaped in cross-section.

30

16. An apparatus according to either claim 8 or 15, wherein the second screen is tapered at the bottom.

17. An apparatus according to any one of claims 8, 15 or 16, wherein the second screen has a mesh size that prevents particles greater than 0.9 mm in diameter from passing therethrough.

5

18. An apparatus according to any one of claims 7 to 17, wherein the first tank is divided into the first and second chambers by a baffle wall.

19. An apparatus according to claim 18, wherein the first portal is provided in the  
10 baffle wall.

20. An apparatus according to either claim 18 or 19, wherein the baffle wall is provided with an overflow weir.

15 21. An apparatus according to any one of claim 7 to 20, wherein the second tank is divided into the third and fourth chambers by a second baffle wall.

22. An apparatus according to claim 21, wherein the second portal is provided in the second baffle wall.

20

23. An apparatus according to either claim 21 or 22, wherein the second baffle wall is provided with an overflow weir.

24. An apparatus according to any one of claims 7 to 23, wherein the treatment  
25 means includes a plurality of containers arranged to provide purifying/disinfecting agent to liquid in the fourth chamber.

25. An apparatus according to claim 24, wherein the containers are arranged to introduce a greater dose of the agent to liquid in the fourth chamber as the liquid level  
30 increases.

26. An apparatus for purifying liquids, the apparatus including:

a first vessel having a first chamber with a first inlet; and  
a second vessel having a second chamber with an outlet,  
wherein the first chamber is connected to the second chamber by a connecting  
portal, the connecting portal being lower within the second vessel than the outlet,  
5       wherein a screen is provided in the first chamber for screening liquid entering  
the portal,  
      whereby, in use, particles of a size larger than permitted to pass through the  
screen are collected in the first chamber and particles or fluid with a lower specific  
gravity than the purified waste water tend to float and not pass through the portal into  
10      the second chamber.

27. An apparatus according to claim 26, wherein the first and second vessels may be  
formed by dividing a tank.

15      28. An apparatus according to claim 26, wherein the first and second vessels may be  
formed in separate tanks.

29. An apparatus according to any one of claims 26 to 28, wherein the first chamber  
has an access hole for periodic removal of material that does not pass through the  
20      screen.

30. An apparatus according to any one of claims 26 to 29, wherein the apparatus  
includes a third vessel having a third chamber, the third vessel intervening between the  
screen and the portal for collection of floating material.

25

31. An apparatus according to claim 30, wherein the third chamber has an access  
hole for periodic removal of material that is collected in the third chamber.

32. An apparatus according to any one of claims 26 to 31, wherein a screen is  
30      provided in a first tank, the screen dividing the first tank into the first vessel and a fourth  
vessel having a fourth chamber.

33. An apparatus according to claim 32, wherein the portal is provided in a dividing wall of a second tank, the dividing wall dividing the second tank into the third vessel and the second vessel, the fourth chamber connected to the third chamber by a connecting pipe.

5

34. An apparatus according to claim 33, wherein the connecting pipe opens into the third chamber higher than the portal.

35. An apparatus according to any one of claims 26 to 34, wherein the apparatus 10 includes a fifth vessel for collecting heavy materials, the fifth vessel having an egress port higher in the tank than an ingress port.

36. An apparatus according to claim 35, wherein the egress port is an opening of an egress pipe that extends downwardly into the fifth vessel before exiting the fifth vessel.

15

37. An apparatus according to claim 36, wherein the egress pipe is located in the centre of the fifth vessel.

38. An apparatus according to any one of claims 35 to 37, wherein the fifth vessel 20 and the first vessel are arranged to be in a circuit for fluid circulating between the first vessel and the fifth vessel.

39. An apparatus according to any one of claims 26 to 38, wherein the screen is V shaped in cross section, a nose of the V pointing towards incoming flow of liquid from 25 the inlet.

40. An apparatus according to any one of claims 35 to 38, wherein the screen directs fluid into a pipe leading to the fifth vessel and opening into the fifth vessel to form the ingress port.

30

41. An apparatus according to either claim 36 or 37, wherein the egress pipe from the fifth vessel leads to the first vessel and opens into the first vessel to form a second

inlet to the first vessel, the second inlet arranged to direct fluid flow at the nose of the screen.

42. An apparatus according to any one of claims 26 to 41, wherein the apparatus  
5 further includes a treatment tank arranged to disperse a treatment agent therein, the treatment tank receiving liquid from the outlet of the second chamber.

43. An apparatus for purifying liquid including:  
a first vessel having a first chamber and a second chamber; and  
10 a second vessel having a third chamber and a fourth chamber,  
wherein the first chamber is connected to the second chamber by a dividing member, the dividing member having a screen for allowing screened waste water to be passed into the second chamber, the screen being V shaped in cross section, a nose of the V pointing towards an incoming flow of liquid;  
15 wherein the third chamber is connected to the fourth chamber by a first portal, the first portal being lower in the vessel than an outlet inlet to the fourth chamber;  
whereby, in use, particles of a size larger than permitted to pass through the screen are collected in the first chamber and particles or fluid with a lower specific gravity than the purified liquid will float and be collected in the third chamber.

20  
44. A waste collection tank comprising:  
a tank member having a top and a bottom;  
an inlet to the tank member between the top and the bottom;  
an outlet pipe having an opening into the inside of the tank member between the  
25 inlet and the top, the pipe extending downwardly towards the bottom and then out of the tank member.

45. An apparatus for purifying liquid including:  
a first vessel having a first chamber and a second chamber, the first chamber  
30 being connected to the second chamber by a dividing member, dividing member having a screen for allowing screened liquid to be passed into the second chamber, the screen being V shaped in cross section and the nose of the V pointing towards incoming flow

of liquid; and

a waste collection tank having a top and a bottom,  
wherein the first chamber of the first vessel is connected to the waste collection tank by  
a pipe leading from the first chamber to an inlet of the collection tank between the top  
5 and the bottom;

wherein the an outlet pipe of the collection tank has an opening into the inside of  
the tank member between the inlet and the top, the pipe extending downwardly towards  
the bottom and then out of the collection tank,

10 whereby, in use, particles of a size larger than permitted to pass through the  
screen are collected in the first chamber and heavy particles or fluid having a greater  
specific gravity than the liquid will collect in the collection tank.

46. A liquid purifying apparatus including one or more of the following tanks:

15 a filtration tank including a screen member dividing the tank into a first chamber  
and second chamber, a portion of the screen member being V-shaped in cross-section,  
the portion having an apex edge, an apex of the V-shape pointing toward an incoming  
liquid stream, whereby particles of size larger than allowed to pass through the screen  
are collected in the filtration tank and the incoming liquid stream reduced blockages of  
the screen member;

20 a treatment tank including a treatment agent dispensing means mounted to the  
support means, wherein the treatment agent dispensing means includes is arranged to  
dispense the treatment agent upon immersion in liquid,

25 a floating material collection tank including a third chamber and a fourth  
chamber, wherein the third chamber is connected to the fourth chamber by a first portal,  
the first portal being lower in the tank than an inlet to the third chamber, whereby, in  
use, fluid or particles that have a lower specific gravity will float and be collected in the  
third chamber;

30 a waste collection tank including a top, a bottom, an inlet to the waste collection  
tank between the top and the bottom and an outlet pipe having an opening into the  
inside of the waste collection tank between the inlet and the top, the outlet pipe  
extending downwardly towards the bottom and then out of the waste collection tank,  
whereby heavy liquids or particles are collected in the waste collection tank;

wherein the one or more of the tanks are connected to purify liquid passing therethrough.

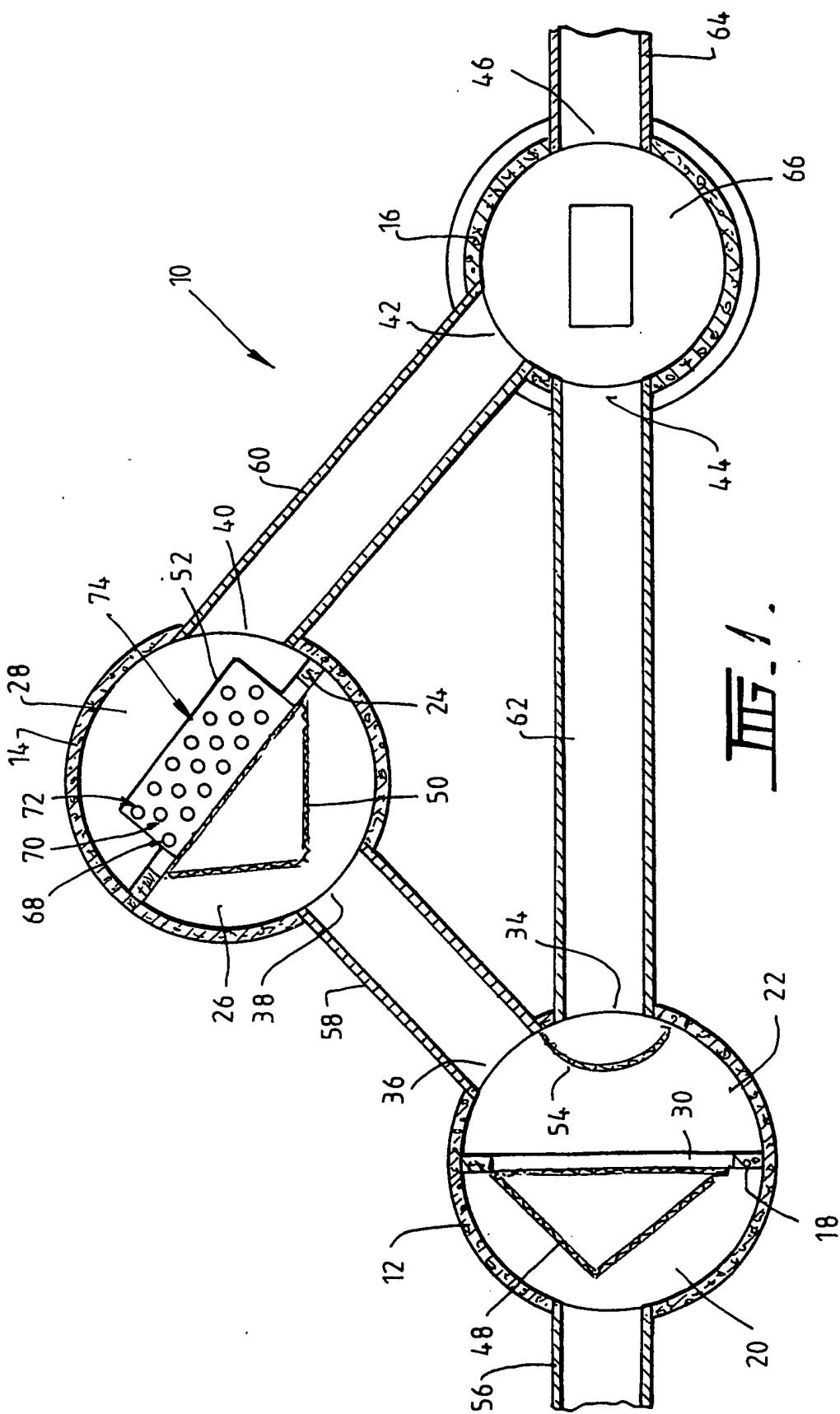
47. A treatment tank substantially as hereinbefore described with reference to the  
5 relevant accompanying figures.

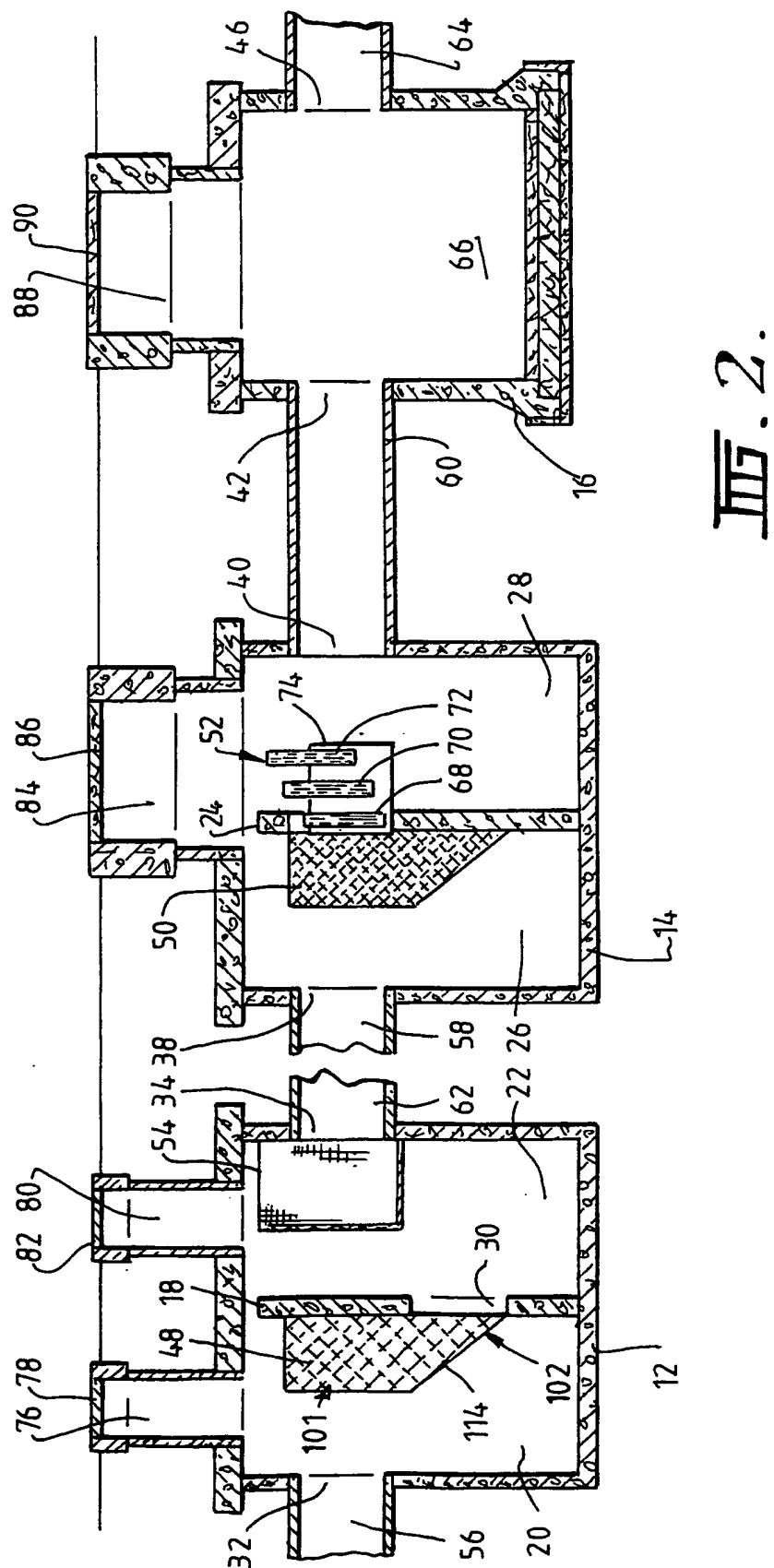
48. A screen for use in a filtration tank substantially as hereinbefore described with reference to the relevant accompanying figures.

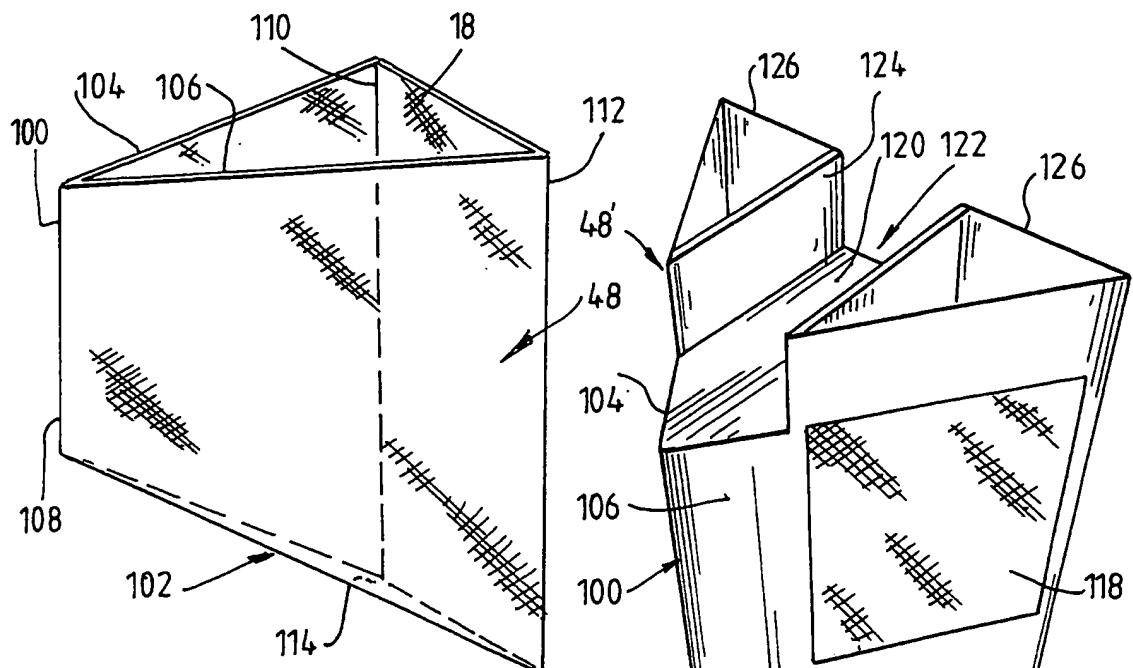
10 49. A filtration tank substantially as hereinbefore described with reference to the relevant accompanying figures.

50. An apparatus for purifying liquid substantially as hereinbefore described with reference to the relevant accompanying figures.

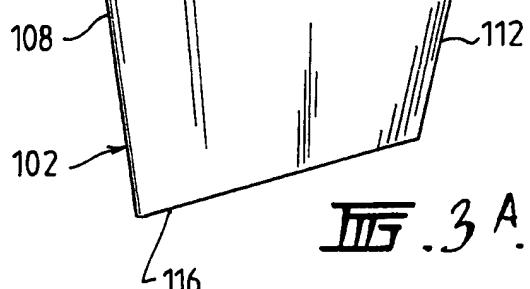
15 51. A waste collection tank substantially as hereinbefore described with reference to the relevant accompanying figures.



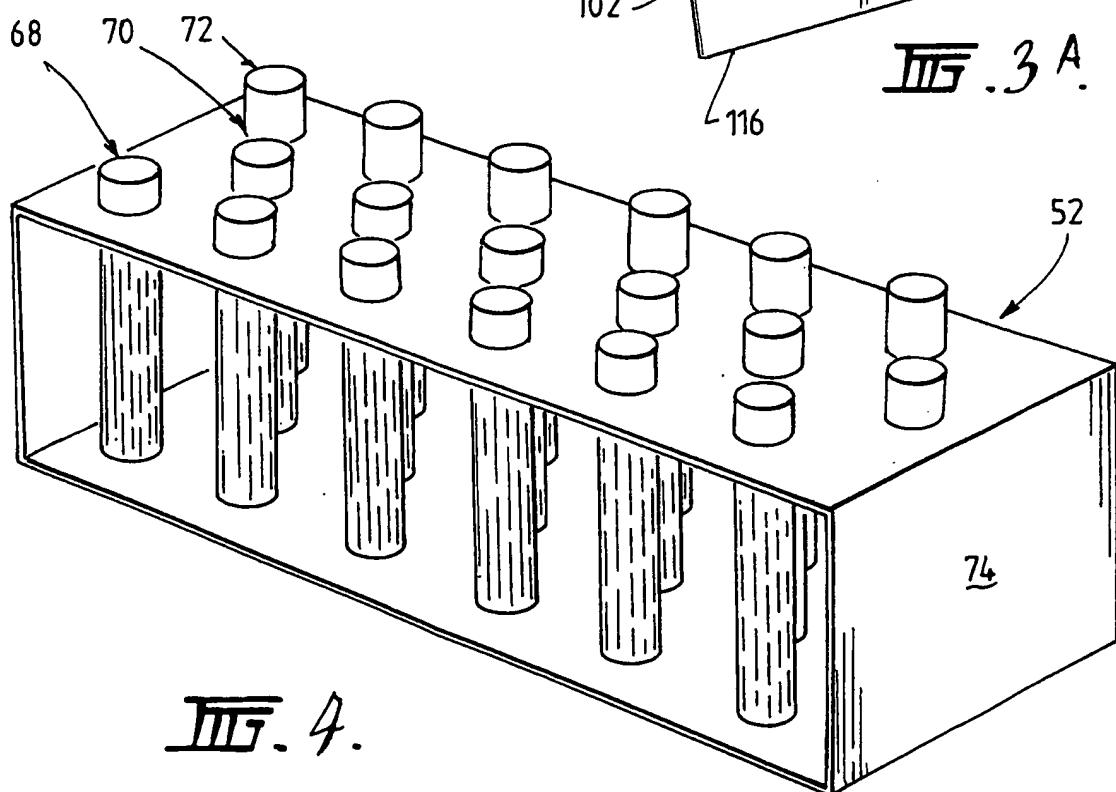




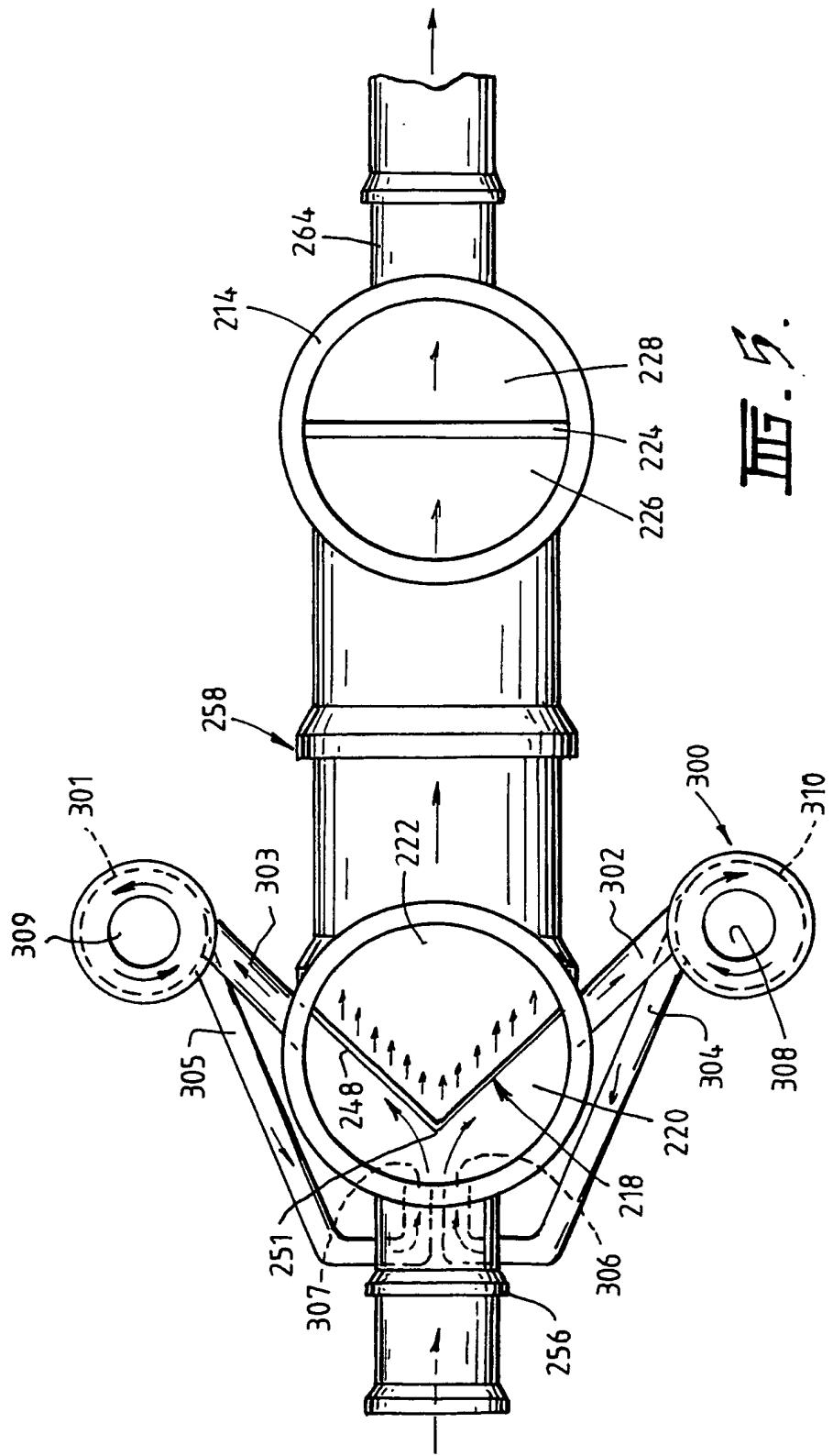
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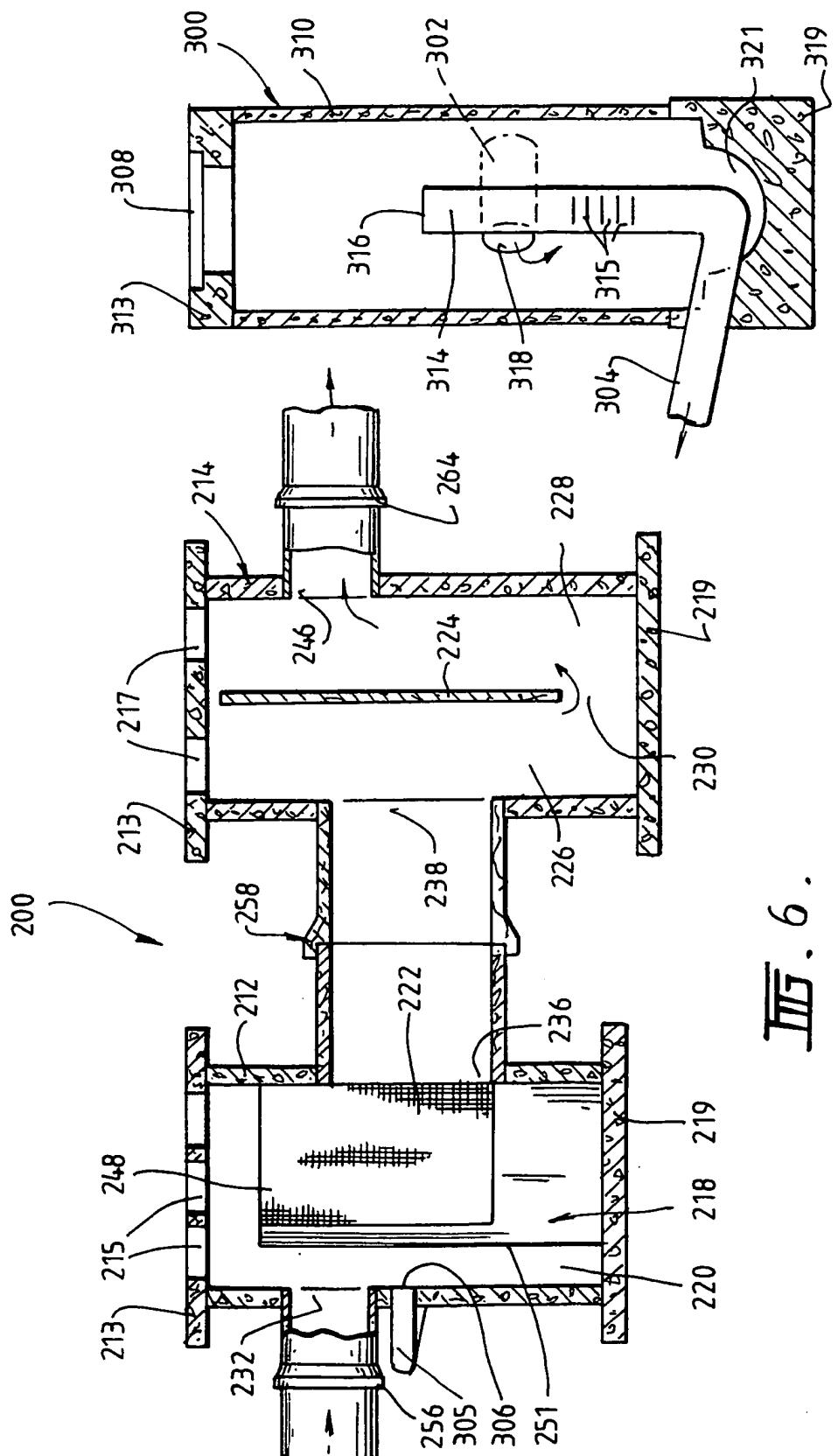


III. 3 A.



III. 4.





III. 6.

III. 7.

## INTERNATIONAL SEARCH REPORT

International application No. PCT/AU02/01361
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## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. 7: E02B 15/14, 15/04, E03F 5/14, B01D 35/28, 35/22, C02F1/40

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

SEE ELECTRONIC DATA BASE BELOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Wpat; IPC E02B15/14, E02B 15/04, E03F 5/14, B01D35/28, 35/22 and "V-Shaped"

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2203961 A (Aral Machinery Corp.) 2 November 1988 See whole document	1-3, 43, 45-46, 48
X	US 6294004 B ( Summers) 25 September 2001 See whole document	1-3, 43, 45-46, 48
P X	US 6398829 A (Shinler) 4 June 2002 See whole document.	1-3, 43, 45-46, 48

 Further documents are listed in the continuation of Box C See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 22 November 2002	Date of mailing of the international search report 4 <sup>th</sup> Dec 2002
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer G.Carter Telephone No : (02) 6283

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU02/01361

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4359330 A ( Copley) 16 November 1982 See whole document	1-3,43,45-46,48

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/AU02/01361

**Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos :  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos :  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos :  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1-3, 43 45-46,48 are characterised by a V shaped screen.

Claims 4-6,47 are characterised by first and second dispensers with the second dispenser mounted lower than the second.

Claims 7-42,49,50 are characterised by a multi chamber apparatus for purifying a liquid with flotation of lower specific gravity material and screening of particles.

Claims 44,51 are characterised by a tank with an inlet and outlet.

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:1-3,43,45-46,48

**Remark on Protest** The additional search fees were accompanied by the applicant's protest. No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/AU02/01361

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
GB	2203961	FR	2614215	JP	63264110	US	5011023
US	6294004	AU	200121389	WO	20014585	EP	1239967
US	6398829	EP	1122365				
US	4359330	AU	543692	WO	8201325	GB	2095577

END OF ANNEX

## REVISED VERSION

(19) World Intellectual Property Organization  
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WO 03/031730 A1(51) International Patent Classification<sup>2</sup>: E02B 15/04, E03F 5/14, B01D 35/28, 35/22, C02F 1/40

(74) Agent: GRIFFITH HACK; 256 Adelaide Terrace, Perth, Western Australia 6000 (AU).

(21) International Application Number: PCT/AU02/01361

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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PS 0507	12 February 2002 (12.02.2002)	AU

(71) Applicant (for all designated States except US): BLUE-PORT NOMINEES PTY LTD [AU/AU]; 21-23 Eva Street, Maddington, Western Australia 6109 (AU).

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventor; and

Published:

(75) Inventor/Applicant (for US only): WOMRALL, Shane, John [AU/AU]; 21-23 Eva Street, Maddington, Western Australia 6109 (AU).

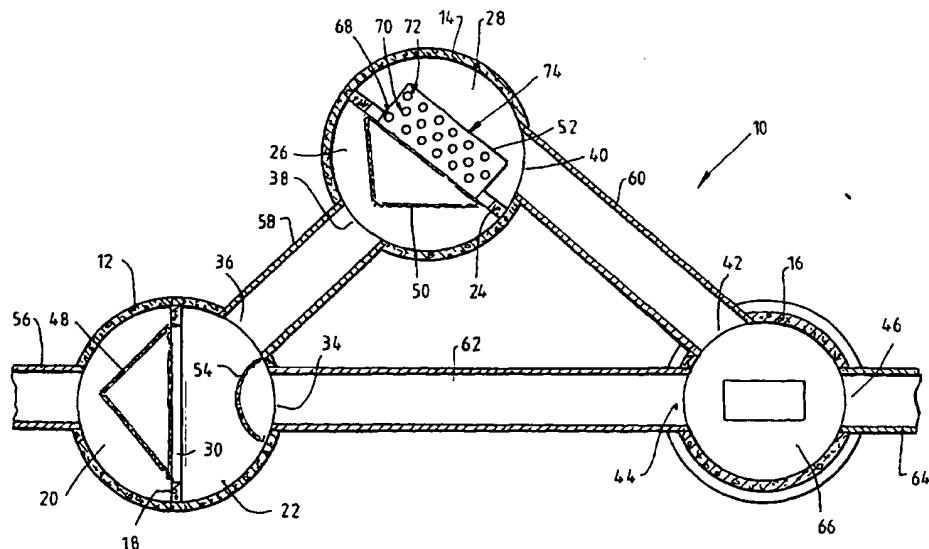
— with international search report

[Continued on next page]

(54) Title: LIQUID PURIFYING APPARATUS



WO 03/031730 A1



(57) Abstract: A liquid purifying apparatus includes one or more tanks including a filtration tank including a V-shaped screen, a treatment for dispensing a treatment agent upon immersion in liquid, a floating material collection tank, and a heavy material collection tank. One or more of the tanks are connected to purify liquid passing therethrough.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(15) **Information about Correction:**  
see PCT Gazette No. 20/2003 of 15 May 2003, Section II

(88) **Date of publication of the revised international search report:**

15 May 2003

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International application No. PCT/AU02/01361
---

## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. 7: E02B 15/04, E03F 5/14, B01D 35/28, 35/22, C02F1/40

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

SEE ELECTRONIC DATA BASE BELOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Wpat; IPC E02B 15/04, E03F 5/14, B01D 35/28, 35/22 and "V-Shaped"

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P X	US 6398829 A (Shinler) 4 June 2002 See whole document.	1-3, 43, 45-46, 48

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"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  
22 November 2002

Date of mailing of the international search report

25 MAR 2003

Name and mailing address of the ISA/AU  
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Authorized officer

G.Carter  
Telephone No : (02) 6283

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU02/01361

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**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/AU02/01361

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2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
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**Remark on Protest**

The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/AU02/01361**

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US	6294004	AU	200121389	WO	20014585	EP	1239967
US	6398829	EP	1122365				
US	4359330	AU	543692	WO	8201325	GB	2095577

END OF ANNEX

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